

WHAT IS CLAIMED IS:

1. An oxide ceramic material comprising aluminum oxide as a principal component, and at least one selected from A and B shown below as an auxiliary component:

A: niobium oxide and copper oxide

B: copper oxide, titanium oxide, and silver oxide.

2. The oxide ceramic material according to claim 1, wherein

a content of the principal component in the entirety of the oxides is not less than 80 mass% and not more than 98 mass%, and

in the case where all the rest of the components are the foregoing auxiliary components, a content of the auxiliary components is not less than 2 mass% and not more than 20 mass%, or in the case where other third components are contained in addition to the foregoing auxiliary components, a content of a sum of the auxiliary components and the third components preferably is not less than 2 mass% and not more than 20 mass%.

3. The oxide ceramic material according to claim 1, wherein in the case where the auxiliary components are those of A, assuming an entirety of a sum of the auxiliary components is 100 mass%, percentages of niobium and copper oxide are in the following ranges, respectively:

$40 \text{ mass\%} \leq \text{niobium oxide} \leq 70 \text{ mass\%}$

$30 \text{ mass\%} \leq \text{copper oxide} \leq 60 \text{ mass\%}$

4. The oxide ceramic material according to claim 1, further comprising at least one selected from titanium oxide, silver oxide, and bismuth oxide, in the case where the auxiliary components are those of A.

5. The oxide ceramic material according to claim 4, wherein, assuming that an entirety of a sum of the auxiliary components is 100 mass%, percentages of niobium oxide, copper oxide, titanium oxide, silver oxide, and bismuth oxide are in the following ranges:

$30 \text{ mass\%} \leq \text{niobium oxide} \leq 70 \text{ mass\%}$

$10 \text{ mass\%} \leq \text{copper oxide} \leq 60 \text{ mass\%};$

0 mass% ≤ titanium oxide ≤ 30 mass%;

0 mass% ≤ silver oxide ≤ 30 mass%;

0 mass% ≤ bismuth oxide ≤ 40 mass%.

- 5 6. The oxide ceramic material according to claim 1,
 wherein, in the case where the auxiliary components are those of B,
 assuming that an entirety of a sum of the auxiliary components is 100 mass%,
 percentages of copper oxide, titanium oxide, and silver oxide are in the
 following ranges, respectively:
- 10 10 mass% ≤ copper oxide ≤ 90 mass%;
 5 mass% ≤ titanium oxide ≤ 60 mass%;
 5 mass% ≤ silver oxide ≤ 40 mass%.
- 15 7. The oxide ceramic material according to claim 1, further containing 0.1
 mass% to 2.0 mass% of manganese oxide with respect to an entirety of the
 oxides assumed as 100 mass%.
- 20 8. The oxide ceramic material according to claim 1,
 wherein the oxide ceramic material is sintered so as to have a relative
 density of not less than 90 %.
- 25 9. The oxide ceramic material according to claim 1,
 wherein the oxide ceramic material has a heat conductivity of not less
 than 5 W/m·k.
- 30 10. The oxide ceramic material according to claim 1,
 wherein the oxide ceramic material has a heat conductivity of not less
 than 10 W/m·k.
- 35 11. The oxide ceramic material according to claim 1,
 wherein the oxide ceramic material has a dielectric loss at 1 MHz of not
 more than 0.05.
12. The oxide ceramic material according to claim 1,
 wherein the oxide ceramic material has a dielectric loss at 1 MHz of not
 more than 0.01.

13. The oxide ceramic material according to claim 1,
wherein the oxide ceramic material is obtained by mixing particles of
either a metal material or a metal oxide material, molding the same, and
sintering the same at a temperature of not higher than 950°C.

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14. The oxide ceramic material according to claim 1,
wherein the oxide ceramic material is obtained by mixing particles of
either a metal material or a metal oxide material, then calcining and
pulverizing the same, and thereafter, molding the same, and sintering the
10 same at a temperature of not higher than 950°C.

15. A ceramic substrate comprising, at least in an internal layer:
an insulation layer made of an oxide ceramic material,
the oxide ceramic material containing aluminum oxide as a
15 principal component, and at least one selected from at least A
and B shown below as an auxiliary component:

A: niobium oxide and copper oxide

B: copper oxide, titanium oxide, and silver oxide; and
a conductive body containing silver as a principal component.

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16. A ceramic laminate device comprising, at least in an internal layer:
an insulation layer made of an oxide ceramic material,
the oxide ceramic material containing aluminum oxide as a
principal component, and at least one selected from at least A
25 and B shown below as an auxiliary component:

A: niobium oxide and copper oxide

B: copper oxide, titanium oxide, and silver oxide; and
a conductive body containing silver as a principal component.

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30 17. A power amplifier module comprising a ceramic substrate or a ceramic
laminate device, and a power amplifier element mounted thereon,
wherein the ceramic substrate or the ceramic laminate device includes,
at least in an internal layer:

an insulation layer made of an oxide ceramic material,

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the oxide ceramic material containing aluminum oxide as a
principal component, and at least one selected from at least A
and B shown below as an auxiliary component:

A: niobium oxide and copper oxide

B: copper oxide, titanium oxide, and silver oxide; and
a conductive body containing silver as a principal component.